STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Sewage and Waste Technology		**1010134281010135218**
Field of study **Environmental Engineering Extramural First-**	Profile of study (general academic, practical) **(brak)**	Year /Semester **4 / 8**
Elective path/specialty **-**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **part-time**	
No. of hours Lecture: **20** Classes: **-** Laboratory: **10** Project/seminars: **10**		No. of credits **6**
Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**	
Education areas and fields of science and art **technical sciences** **Technical sciences**		ECTS distribution (number and %) **6 100%** **6 100%**

Responsible for subject / lecturer:

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Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Student should have a basic knowledge about water technology, mathematics, chemistry, fluid mechanics and general knowledge from environmental engineering
2	**Skills**	Student should be able to perform mathematical calculations, physical, chemical, mechanics of the fluids and calculation of equipment and facilities of water and wastewater treatment plants.
3	**Social competencies**	Awareness to constantly update and supplement knowledge and skills.

Assumptions and objectives of the course:

- The objective of the course is to broaden the knowledge and skills scopes of wastewater technology necessary for the selection of technology methods of basic pollutants removal from municipal wastewater.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Student knows the technological systems of wastewater treatment depending on the wastewater characterization on influent and effluent. - [[K2_W03, K2_W04, K2_W07]]
2. Student knows the design methods of basic technological processes and technological systems of wastewater treatment and sludge handling and disposal systems for waste and sludge produced at WWTP. - [[K2_W03, K2_W04, K2_W07]]
3. Student understands basics of experiment in pre-design research of WWTP. - [[K2_W03, K2_W04, K2_W07]]

Skills:

1. Student can prepear the design concept of technology for municipal wastewater treatment plant. - [[K2_U01, K2_U12,]]
2. Student can work in a team (measurements and elaboration of the obtained experimental data). - [[K2_U01, K2_U12,]]

Social competencies:

1. Student understands the need for teamwork in solving theoretical and practical problems. - [[K2_K03]]
2. Student understands the need of systematic deepening and broadening his/her competences. - [[K2_K01]]

Assessment methods of study outcomes

-Lecture

1. Attendance and lecture activity checkup

2. Written finale exam

Laboratory exercises

1. Short entrance written test before each laboratory

2. Written report of each laboratory exercise

3. Written final test regarding all exercises

4. Activity evaluation during each laboratory

Project

1. Verification of project advancements and independent design work after each of 3 project parts (Part 1 ? primary treatment process, Part 2 ? biological treatment, Part 3 ? sludge handling)

2. Written exam after each of 3 project part

Course description

-Lecture

Ecology in water and wastewater management. Type and characteristics of wastewater. Flow rates (quantity characteristic). Composition of wastewater ? wastewater characteristics (quality characteristic). Loading of contaminants. Unit loads. Population equivalent (p.e.). Regulation for effluent wastewater to sewer systems and recipients. Efficiency of treatment process at wastewater treatment plants (WWTP). Types of WWTPs ? process flowsheets, processes used, pollutants removed, devices and facilities used, effectiveness. Mechanical WWTP (screening, grit chambers, grease tank, primary settling tanks). Chemical WWTP. Biological WWTP (trickling filters, activated sludge). Integrated biological processes for BOD removal (organic components) and Nutrient Removal (nitrogen and phosphorus). Types of solid and sludge wastes at WWTP. Sludge characteristic. Processes and devices used for treatment and disposal of sludge wastes: thickening, stabilization (anaerobic digestion, aerobic digestion, alkaline stabilization), dewatering. Sludge waste disposal - utilization and landfilling.

Laboratory subjects:

1. Hydraulic efficiency of settling tanks.
2. Effectiveness of aeration facilities
3. Activated sludge process.

Project subjects:

1. Balance of rates (quantity characteristic) and composition of wastewater (quality characteristic). Loading of contaminants. Population equivalent (p.e.). Technological calculations of mechanical WWTP (screening, grit chambers, primary settling tanks)
2. Technological calculations of biological WWTP with nutrient removal (activated sludge, final settling tanks)
3. Technological calculations of devices used for treatment of sludge wastes {gravity and mechanical thickening, anaerobic conventional German digesters with reinforced concrete construction, devices for dewatering).

Basic bibliography:

1. Praca zbiorowa pod redakcją Z. Dymaczewskiego: Poradnik eksploatatora oczyszczalni ścieków. Wyd. III, PZITS, Oddz. Wielkopolski, Poznań 2011

2. Heidrich Z., Witkowski A.: Urządzenia do oczyszczania ścieków - Projektowanie, przykłady obliczeń. Wyd. ?Seidel-Przywecki? Sp. z o.o., Warszawa 2010

3. Jaroszynski T.: Materiały pomocnicze do ćwiczeń projektowych. Maszynopis w formacie pdf. Poznań 2014

4. Dymaczewski Z.: Materiały pomocnicze do ćwiczeń laboratoryjnych. Poznań 2014

Additional bibliography:

1. Wastewater Engineering. Treatment and Reuse. Metcalf & Eddy. Inc. Mc Graw Hill, wyd. 4, 2003

Result of average student's workload

Activity	Time (working hours)

1. Lecture participation	30
2. Laboratory participation	30
3. Preparation for laboratory exercises	10
4. Preparation of the laboratory report at home	10
5. Project participation	30
6. Project preparation at home	25
7. Project and laboratory consultation with the instructor (Student is assumed to attend 5 consultations): 5 hours	5
8. Preparation for laboratory final examination	10
9. Preparation for lecture final examination and final exam attendance	30

Student's workload

Source of workload	hours	ECTS
Total workload	180	6
Contact hours	90	3
Practical activities	90	3